



CS 428
“The Five
Orders of
Ignorance”
(Armour)

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The true nature of software

- ◇ Software is a knowledge-storage medium
- ◇ Developing software is a knowledge-acquiring activity
- ◇ We seldom have perfect knowledge ahead of time
 - ◇ If we do, then why are we doing this? The problem has already been solved.
- ◇ Therefore, software development is an inherently inefficient exploration and discovery process
 - ◇ We determine what works
 - ◇ We determine what does not work (for this particular system)
- ◇ Observations and experiences?

What can happen along the way

- ◇ The problem of late discovery
 - ◇ Blind alleys, significant backtracking
 - ◇ Webster: [Do not Defer the Difficult in IT Projects](#) (2013)
- ◇ Two kinds of knowledge
 - ◇ Again, what doesn't work and what does
 - ◇ Sometimes, what doesn't work is just as valuable, but is often discarded
- ◇ “Corrupted” knowledge
 - ◇ The code often contains artifacts or remnants of our knowledge exploration during development – these may be misleading or obscuring
- ◇ Observations/experiences?

What the discovery process looks like



Exhibit 6. A path through the woods.

What the discovery process yields

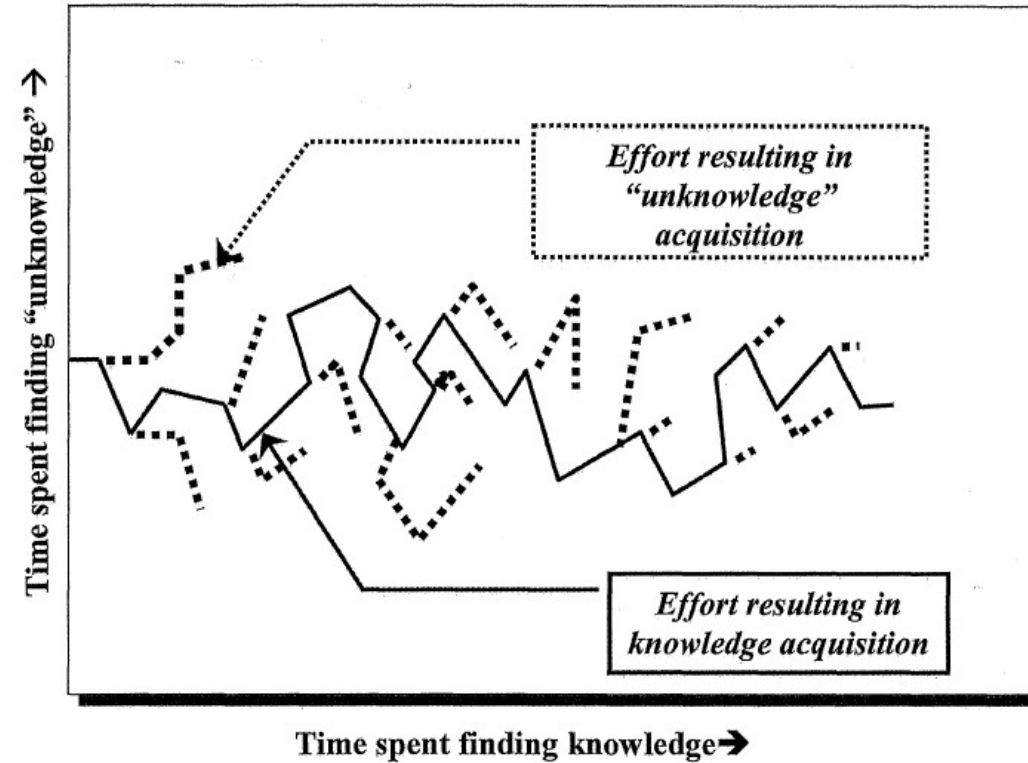


Exhibit 4. Hacking project: Full build.

The five orders of ignorance

- ◇ Zeroth Order: Lack of Ignorance
 - ◇ I know something, I know that I know it, and I can demonstrate I know it
- ◇ First Order: Lack of Knowledge
 - ◇ I don't know something, and I know I don't know it
- ◇ Second Order: Lack of Awareness
 - ◇ I don't know something, and I don't know that I don't know it
- ◇ Third Order: Lack of Process
 - ◇ I lack a process by which I can discover that I don't know that I don't know something
- ◇ Fourth Order: Meta Ignorance
 - ◇ I don't know about the Five Orders of Ignorance

Applied to software development

- ◇ 0th Order: I know how to complete the system
- ◇ 1st Order: I know what I will need to know to complete the system
- ◇ 2nd Order: I don't know yet what I will need to know to complete the system
- ◇ 3rd Order: I don't know how to discover what I need to know to complete the system
- ◇ 4th Order: I have no clue about any of the issues above

Order of Ignorance Cycles

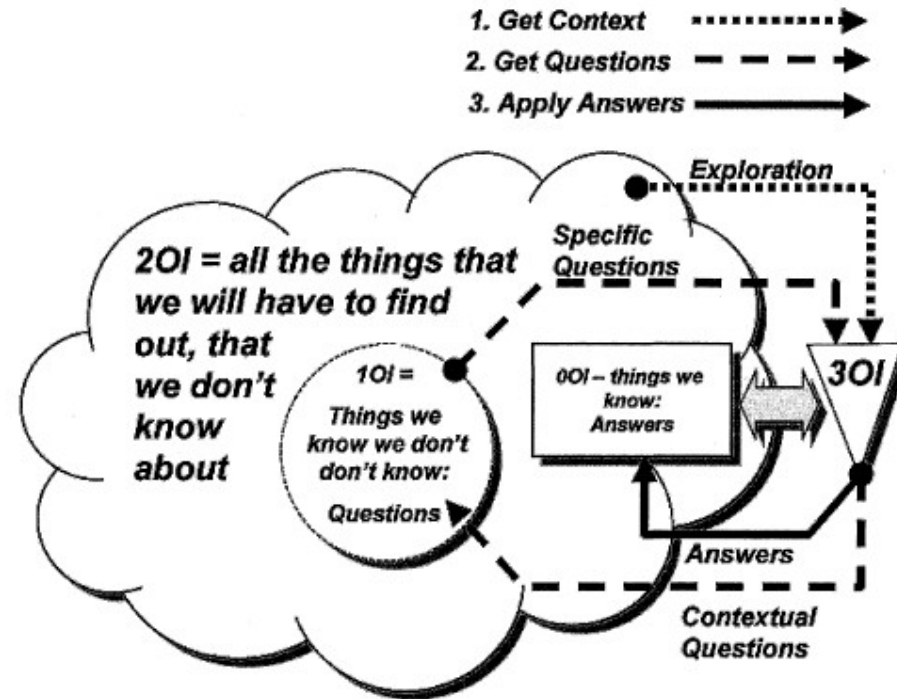
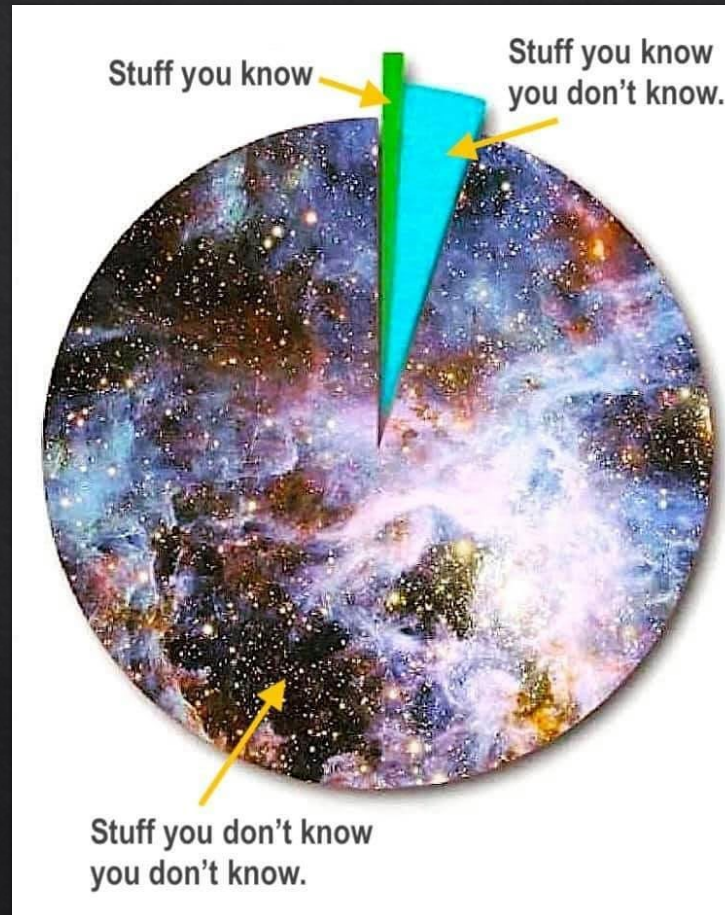


Exhibit 8. Order of Ignorance cycles.

How it actually is



Nature of the process

- ◇ To identify whether there are areas where we have ignorance (need to acquire knowledge)
- ◇ To identify what questions we would need to ask to resolve ignorance in these areas
- ◇ To obtain the answers to these questions in a form that we can usefully integrate into the system
- ◇ Key problems
 - ◇ Acquiring knowledge also illuminates more areas of lack of knowledge
 - ◇ Humans have not found a way to empirically measure knowledge
 - ◇ The critical measure of knowledge in software is that of the knowledge *not* in the software
- ◇ Observations/thoughts?